

The Blue Waxbill *Uraeginthus angolensis*, in an acacia savanna: methodological implications in population density estimations

Grzegorz Kopij^{1,2}

¹ Department of Animal Ecology & Biology, Wrocław University of Environmental & Life Sciences,
ul. Kozuchowska 5b, 51-631 Wrocław, Poland

² Department of Integrated Environmental Science, Ogongo Campus, University of Namibia,
Private Bag 5520 Oshakati, Namibia

* Corresponding author e-mail: grzegorz.kopij@upwr.edu.pl

Received: 5 August 2025 / Accepted: 10 February 2026

Abstract. The population density of the Blue Waxbill was assessed in a study plot (400 ha) composed of natural and man-modified acacia savanna, by the mean of territory mapping method. The plot was located in Ogongo, Omusati Region, north-central Namibia. The breeding population density of the Blue Waxbill changed slightly from 11.3 to 12.0 in particular months. However, if the records from all these months were put together on the map, then the population density was assessed at 20.8 p./100 ha. This is because territory boundaries have shifted in the course of breeding (second or third clutches) and these territories are counted twice. It is therefore recommended to conduct such studies over a shorter period of time (1-2 months).

Keywords: Namibia, savanna, population density, territoriality, mapping method.

1. Introduction

The Blue Waxbill *Uraeginthus angolensis* is a member of the family Estrildidae. The genus includes two other species, the Red-cheeked Cordon-blue *U. bengalus* and Blue-capped Cordon-blue *U. cyanocephalus*. All occur in Africa south of Sahara. The Blue Waxbill is parapatric with the other congeners, while the Blue-capped Cordon-blue is sympatric with the Red-cheeked Cordon-blue to a large extent (Payne, 2010). The Blue Waxbill is a typical representative of small granivore passerines from families such as Estrildidae, Ploceidae, Viduidae, Passeridae and Fringillidae.

The Blue Waxbill is a common inhabitant of savanna, especially partly human-modified Acacia savanna in a close proximity to water. It feeds mainly on grass seeds, with admixture of insects, especially termites. Therefore, it starts

to breed about two months after rain, i.e. in January/February in northern Namibia, when the grass seeds are developed and termites abundant (Payne, 2010). It is monogamous and territorial, but it defends only the immediate vicinity of the nest. It nests solitary, but sometimes in loose colonies (Nuttall, 2005). Little is known about population density of this species. The presented study was undertaken to partly fulfil this gap in our knowledge. The specific goal was to estimate population density in a selected large plot; to investigate monthly changes in this density; to show site tenacity, if any; find whether there are any micro-habitat preferences; and to compare population densities across Africa. In addition to these, the mapping method (Bibby et al., 2012) is tested. The ecological question is how the number of counts conducted over a certain period of time may affect the interpretation (estimation of population density).

2. Methods

2.1. Study area

The study area was located on the UNAM Ogongo campus, Omusati Region, N Namibia (17°700S, 15°310E). The total surface of the study area was 400 ha. Detailed description of the study area has been published by Kopij (2025).

2.2. Data collection

Studies were conducted in 2020. The territory mapping method (Sutherland, 1996; Bibby et al., 2012) has been employed to assess the population densities of the Blue Waxbill breeding in the study plot. Four surveys, each one consisted four counts, of the whole area were conducted in three distinguished periods: February/March, April and Amy/June. Therefore, the total number of morning devoted to the study was 48. Records were plotted on a map 1: 2000. For more details of the method see Kopij (2025).

2.3. Data analysis

At least two records in a clump were required to distinguish an occupied territory (Bibby et al., 2012). Each occupied territory was considered as an equivalent of one breeding pair. Population density was calculated as the number of breeding pairs per 100 ha.

3. Results and discussion

In a mixture of natural and man-modified acacia savanna in the Ogongo, the breeding population density of the Blue Waxbill changed slightly from 11.3 to 12.0 pairs per 100 ha in particular month (Table 1). However, if records from all these

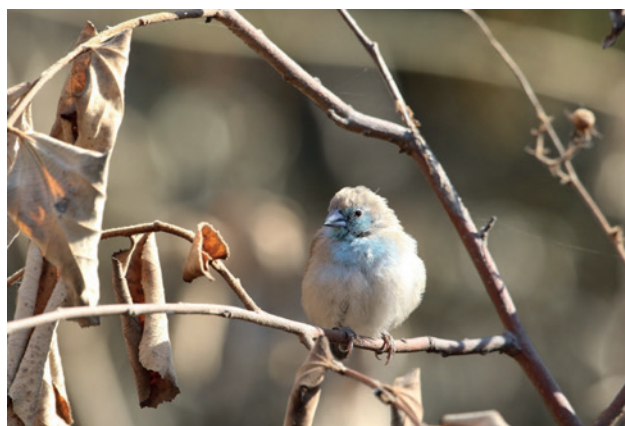


Figure 1. The Blue Waxbill

months were put together on the map, then the population density was assessed at 20.8 p./100 ha. Most territories were established in a close proximity to water reservoirs, canals, oshanas, sand-pits and fences (Fig. 1).

The only reliable population density estimate (25-75 pairs / 100 ha) for the Blue Waxbill originates from an open *Acacia-Dichrostachys* savanna in Limpopo province, South Africa (Tarboton, 1980). However, in recent years, Blue Waxbill population density was estimated by means of the territory mapping method in a few urbanized habitats in the northern Namibia and north-eastern Botswana. It ranged from 29.4 to 69.0 pairs / 100 ha (Table 1), which falls well within the range given by Tarboton (1980). In all these Namibian studies (Table 1), and also in Tsumeb (Kopij, 2021c) and Grootfontein (Kopij, 2021d), and in the norther Namibia at large (Kopij, 2021a) the Blue Waxbill was a dominant breeding bird species (>5% of all breeding pairs of all specie), reaching much higher population densities than in the acacia savanna in Ogongo. It should be, however, pointed out that both in the mopane savanna and in acacia savanna in Ogongo, population densities of the



Figure 2. Natural (left) and human-modified (right) acacia savanna in the study area

Table 1. Population density of the Blue Waxbill (400 ha)

Month	Pairs	Pairs/100 ha
February/March	48	12.0
April	45	11.3
May/June	47	11.8
Overall	82	20.5

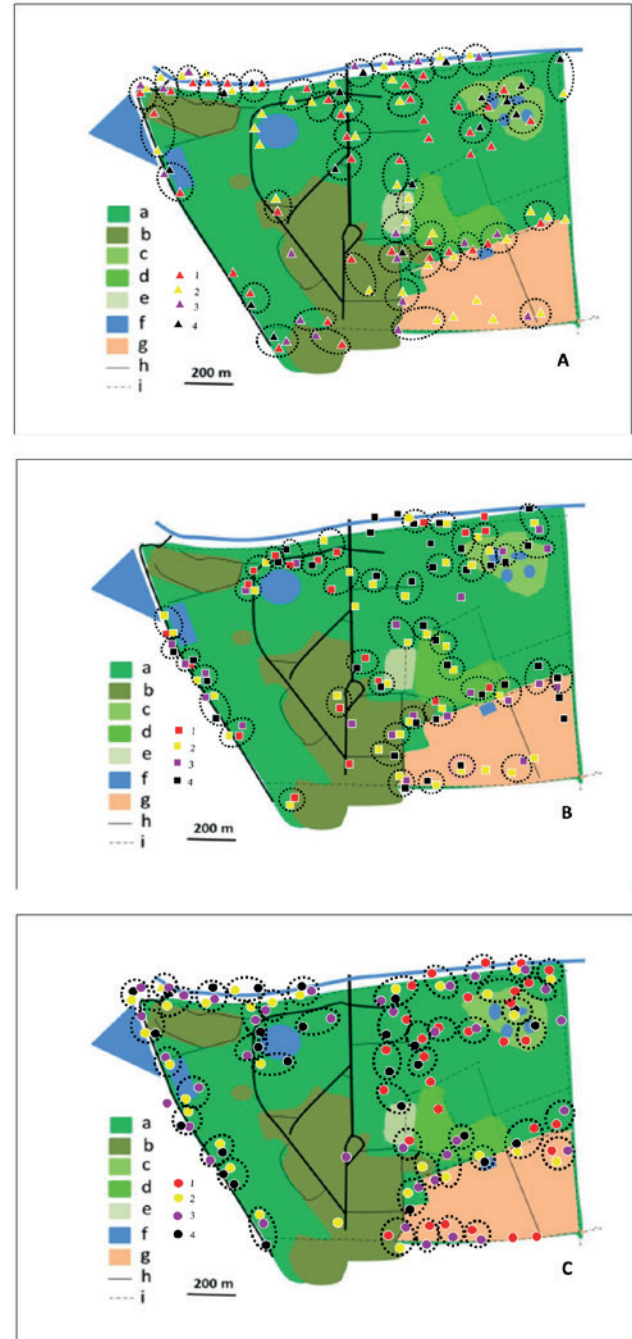
Blue Waxbill were similar (i.e. 9.4 pairs / 100 ha) in mopane savanna (Kopij, 2023) against 11.3-12.0 pairs / 100 in acacia savanna (this study). This short review indicates that the Blue Waxbill reaches higher population densities in urbanized than in natural savanna or woodlands habitats, which is often a case of granivore species (e.g. sparrows, finches, doves), well-adapted to live in urbanized environment which often offer abundant seed food.

There is an assumption for the territory mapping method, that the more counts are conducted, the more accurate results are obtained. When all breeding bird species are counted in temperate or boreal forests of Europe, 8-12 surveys (depending on the habitat, weather conditions and researcher's perception) are required for reliable estimation (Sutherland, 1996, Bibby et al., 2012). The period when the birds can be counted lasts there no more than 100 days (April-June in Central Europe). In southern Africa, the breeding season of many bird species is much more extended. For example in northern Namibia, it starts in August/September and ends in May/June. However, birds should not be counted in the whole period, as the number of territories and their locations may show marked seasonal variation. The studies conducted on the Blue Waxbill population breeding in Ogongo, showed that 12 surveys conducted over a longer study period (Fig. 4) may significantly overestimate the real

Table 2. Breeding population density of the Blue Waxbill in urbanized habitats in northern Namibia and north-eastern Botswana

Habitat	Location	Density [p./100 ha]	Plot size [ha]	Source
Urbanized acacia savanna	Onguediva, Oshana Region, N Namibia	69.0	100	Kopij 2021b
Urbanized acacia savanna	Outapi, Omusati Region, N Namibia	47.7	130	Kopij 2019
Urbanized mixed woodland/savanna	Katima Mulilo, Zambezi Region, NE Namibia	40.8	476	Kopij 2019, 2020a, 2020b
Urbanized Zambezi riparian forest	Katima Mulilo, Zambezi Region, NE Namibia	38.9	54	Kopij 2023
Urbanized mixed woodland/savanna	Kasane, NE Botswana	29.4	160	Kopij 2018

number of this species. This is because territories of many bird species may shift in the course of breeding (second or third clutches), and may be counted twice, as showed for the Blue Waxbill in this study (Fig. 3). It is therefore

**Figure 3.** Distribution of Blue Waxbill territories in Ogongo in (A) February/March, (B) April and (C) May/June 2020

Explanations: Surveys: 1, 2, 3, 4: first, second, third and fourth survey respectively in the year 2020. Habitats (land uses): a – acacia savanna, b – built-up area, c – disturbed acacia savanna, d – orchard, e – sport field, f – water bodies, g – arable ground, h – roads, i – fences. 1, 2, 3, 4 – records of birds during survey 1, 2, 3, or 4. Encircled are occupied territories

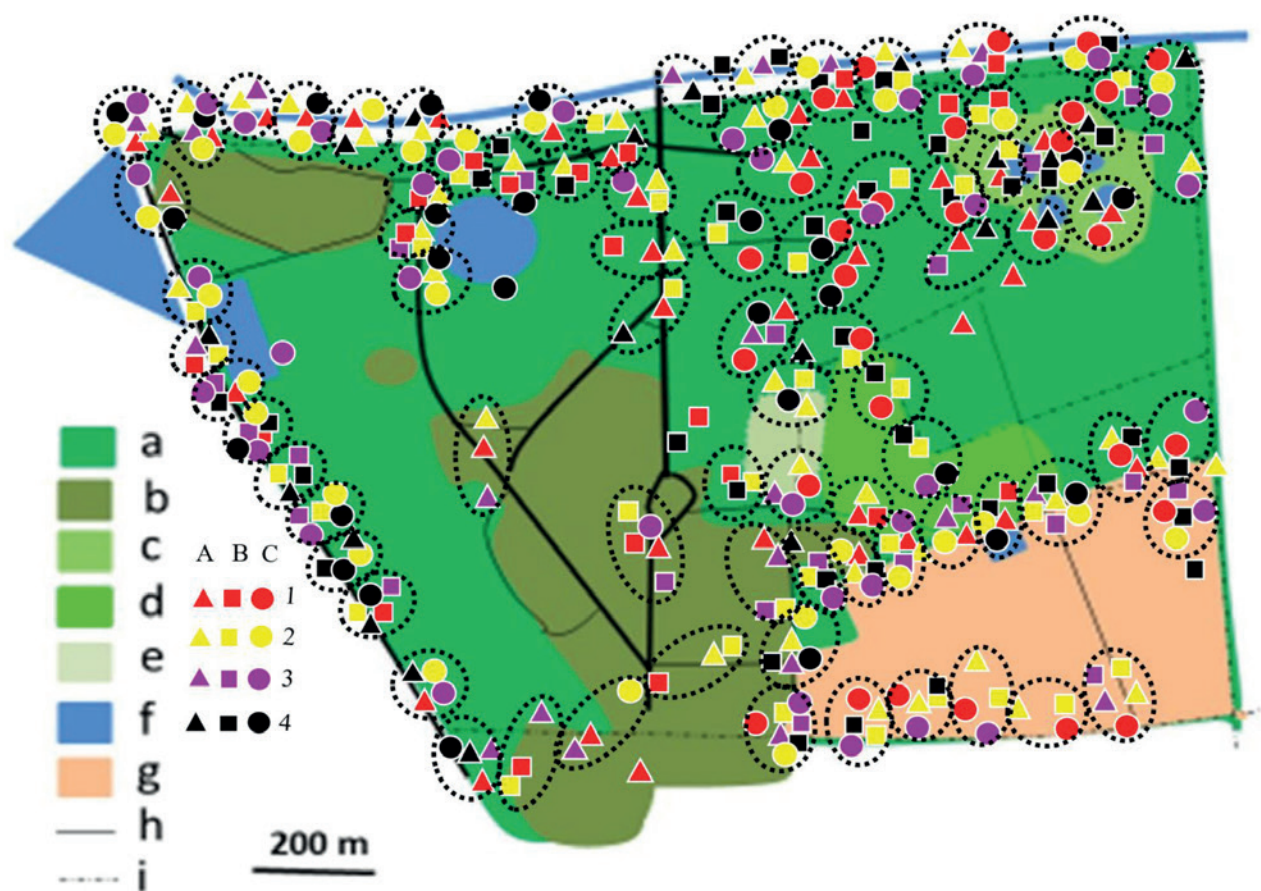


Figure 4. Distribution of Blue Waxbill territories in February-June in Ogongo in 2020

Explanations: 1, 2, 3, 4: records of the first, second, third and fourth survey respectively in February/March (A), April (B) and May/June (C) 2020 in the 2020. Habitats (land uses): a – acacia savanna, b – built-up area, c – disturbed acacia savanna, d – orchard, e – sport field, f – water bodies, g – arable ground, h – roads, i – fences

recommended to conduct such studies over a shorter period of time (1-2 months), and for most insectivorous bird species preferable on the onset of the rainy season. For granivorous and frugivorous species more suitable would be probably the end of this season.

References

- Bibby C.J., Burgess N.D., Hill D.A., 2012, Bird censuses techniques. Academic Press, London.
- Kopij G., 2018, Atlas of breeding birds of Kasane. *Babbler* 64: 3–15.
- Kopij G., 2019, Population density and structure of birds breeding in an urban habitat dominated by large baobabs (*Adansonia digitata*), Northern Namibia. *Biosystem Diversity* 27(4): 354–360.
- Kopij G., 2020a, Structure of breeding bird community along the urban gradient in a town on Zambezi River, northeastern Namibia. *Biologija* 66(1): 1–9.
- Kopij G., 2020b, Changes in the structure of avian community along a moisture gradient in an urbanized tropical riparian forest. *Polish Journal of Ecology* 68(3): 251–262.
- Kopij G., 2021a, Avian diversity along a precipitation gradient in southern Africa. *Zoodyversity* 55(1): 17–24.
- Kopij G., 2021b, Population density and structure of a breeding bird community in a suburban habitat in the Cuvelai drainage system, northern Namibia. *Arxius de Miscel·lània Zoològica* 19: 313–320.
- Kopij G., 2021c, Seasonal changes in the structure of an avian community in an urban habitat in northern Namibia. *Biologija* 67(4): 197–204.
- Kopij G., 2021d, Structure of avian communities of suburbs of Rundu and Grootfontein, NE Namibia. *Berkut* 30(1): 20–24.

- Kopij G., 2025, Seasonal changes in population densities of the Grey Go-away-bird *Corythaixoides concolor* in acacia savanna in Namibia. *Biharean Biologist*, 19(1): 52–56.
- Mendelsohn, J., Jarvis A., Roberts C., Robertson T., 2009, Atlas of Namibia. A Portrait of the Land and its People. Sunbird Publishers, Cape Town.
- Nuttall R.J., 2005, Blue Waxbill *Uraeginthus angolensis*; p. 1054–1056. In: Hockey P.A.R., Dean W.R.J., Ryan P.G., Maree S. (eds.) (2005): Roberts' birds of southern Africa. Cape Town: John Voelcker Bird Book Fund.
- Payne R.B., 2010, Family Estrildidae (Waxbills); p. 234–377. In: del Hoyo J, Elliott A, Sergatal J. (eds.). Handbook of Birds of the World. Vol. 10. Barcelona: Lynx Edicions.
- Sutherland W.J., 1996, Ecological Census Techniques: a handbook. Cambridge (U.K.): Cambridge University Press.
- Tarboton W.R., 1980, Avian populations in Transvaal savanna. Proceedings IV Pan-African Ornithological Congress: 113–124.